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ABSTRACT

This paper reports preliminary findings of a 3-year study examining the ability of qualitative and quantitative measures of the home environment variables (HEV's) to contribute to the prediction of third- through fifth-grade students' achievement and growth scores in reading and mathematics. Data were obtained for 198 parent/student pairs from four rural and small urban Wisconsin communities. Three sets each of achievement and growth scores were regressed on selected variables derived from parents' responses to a half-hour telephone interview. Each regression equation also contained a measure of the child's academic aptitude as the predominant predictor. Several HEV's provided significant and durable additional predictive capacity to that provided by the aptitude index. These included (1) hours of maternal employment (negatively associated with all students' and boys' achievement in both reading and math); (2) family socioeconomic status (positively associated with all students' and boys' reading growth and all students' reading achievement); and (3) parents' feeling that the school's greatest strength was the quality of its academic programs (positively associated with girls' reading and math achievement and math growth). Also examined was the indirect link between home environment and academic attainment through HEV associations with self-concept variables related to achievement. In this case, no substantial link was identified. (RH)

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EFFECTS OF PARENTING AND HOME ENVIRONMENT ON STUDENT ACHIEVEMENT IN GRADES 3 to 5*

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Most research in education has focused upon activities that take place in the school and upon interactions between students and teachers. Most studies of students' cognitive growth attempt to identify the teaching techniques and classroom arrangements that are most productive for different types of students. The obvious reason for this approach to research is that schools have control over these variables. They have little or no control over what happens to students during the 80 to 90 percent of their waking hours when they are not in school. If extra-scholastic factors were unrelated to student development, we would do well to ignore them, for certainly there is no more sacrosanct right in this culture than that of parents to raise their children as they see fit. But many family and environmental factors have been shown to influence social and intellectual growth.

In 1966, a controversial report entitled Equality of Education Opportunity (EEO) (Coleman et al., 1966) suggested that by comparison with the contribution of parents and families, schools play a minor role in shaping the development of young people. Becker (1965) posited that

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households impart a dynamic "child quality" to children observable long before the age at which they enter school. It stands to reason that understanding the nature of this "child quality" and the mechanisms of its creation and development in the home will benefit both parents and educators in their mutual task of shaping and molding the child.

Yet parents know little about the comparative value to their children of different potential uses of their time and resources. Most are sincerely interested in doing whatever is best for the children, but too many questions remain unanswered: At what ages is parent involvement most critical? What sort of involvement? What are the characteristics of a healthy and stimulating home environment? Several studies have attempted to provide answers to these questions.

In a recent review of the literature pertaining to family characteristics and student performance in schools, Iverson and Walbert (1982) identified four "schools" of research: the socioeconomic school, the "family constellation school" (emphasizing family size and birth order, etc.), the "British school" (emphasizing parental attitudes and expectations), and the "Chicago school" (emphasizing family behavior and parent-child interactions). These are by no means competing schools of thought, and researchers in one area seldom attempt to discredit or deemphasize the significance of work done in the other three areas. Certainly it is a complex mixture of the socioeconomic, structure, attitude, and behavior characteristics of families, combined with ability and motivational factors of individual students and with a multitude of school and community characteristics (see Figure 1) which must be understood before one can hope to explain the simple observation that some students make rapid progress in school while others progress slowly or not at all.

The Socioeconomic School The association of socioeconomic factors (e.g., the level of education attained by each parent, parental job status, and family income) to reading and mathematics achievement and such measures of affective development as self-concept and teacher affiliation, is well documented. There is little reason to believe that changes in the educational enterprise since 1966 have done much to diminish the strong relationship between socioeconomic status (SES) and cognitive growth identified by the Coleman Commission. If anything, the strength of the relationship seems to have increased. Dreeben (1983) replicated a 1969 study comparing first graders' reading aptitude with a number of other factors and reported a much stronger relationship between SES and aptitude in 1981 (r = 0.48) than had been observed in 1969 (r = 0.12). Bowles (1969) concluded that both father's occupation and the availability of goods in the home (TV, telephone, appliances, study facilities, etc.) as measured by a "consumer durables index" are strong positive predictors of achievement. Heyns (1978) offered evidence that much of the SES-related difference in student achievement is due to differential gains and losses in learning during the months of summer vacation.

Despite the weight of the testimony of this work, however, the mechanisms through which the socioeconomic advantage is transmitted are not well understood. Thomas (1979) hypothesized that children from high-SES backgrounds receive a disproportionately large share of educational resources but, as Rossmiller (1982, p. 6) observed, "Research to date has not yet consistently revealed significant relationships between student learning and the material resources used in their education." Furthermore, there is a conceptual problem with the use of

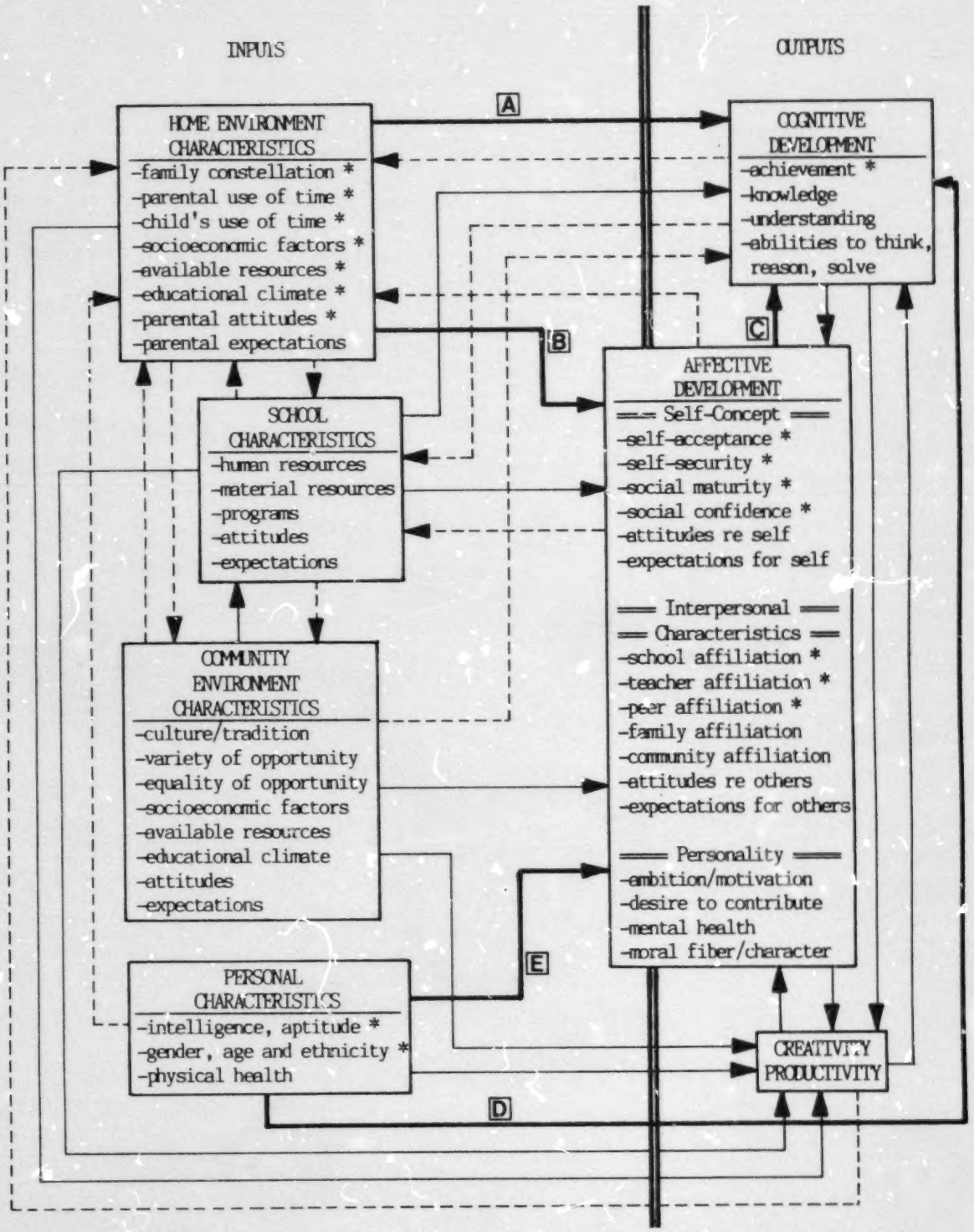

Figure 1. A Conceptual Framework of the Education Production Process for Individual Students
——→ = moderate to strong influence; - - - - - - - - - - → = weak influence.
Absence of arrow indicates negligible or no influence. * = variable examined in this study.

SES factors as independent variables. They tend to conceal, within the cloak of a single index combining a variety of factors, the influences of each individual contributing factor which tend to vary considerably within a given SES level. An important cause and effect question thus remains unanswered: Are differences in socioeconomic status directly responsible for differences in observed levels of cognitive and affective development, or are both SES and student development manifestations of some third set of determinants? This question can be answered only by analyzing the behavior of parents and children in the home and comparing observed differences in behavior with measures of growth while independently controlling for each of the contributors to socioeconomic status.

The "Family Constellation" School A number of researchers in the domain of environmental influences on learning have chosen to focus on the size, composition, and organization of the family as the independent variables of analysis. The abundance of research conducted in this field, as Henderson (1981) observed, may be due in part to the ease of collecting information about and controlling for variation among the family constellation variables. Students' intellectual development, as indexed by a variety of cognitive and affective measures, has been compared to family size, birth order, and birth interval. The employment status of each parent and the presence of other adults in the home have been examined. Adopted children have been compared to natural children, and children from single-parent and reorganized households have been compared to those from households in which both natural parents are present.

Leibowitz (1977) and numerous others have identified negative relationships between family size and student performance, even when family SES was held constant. Zajonk and Markus (1979) presented a Confluence Model to explain their observations that IQ scores vary inversely with family size and suggested that the critical causal factor is birth interval. They argued that intellectual development is a function of the richness of an individual's intellectual environment during early childhood which, in turn, is a function of the average intellectual ability level of all family members. Their Confluence Model has withstood numerous empirical tests and, according to both Ransen (1983) and Walberg and Marjoribanks (1976), is particularly pronounced in families with poorly educated parents who were themselves unable to provide a rich intellectual environment for their first-born children.

Elder (1974), following research on effects of the Great Depression, discovered that parental unemployment can adversely affect a child's performance in school, but the popular belief that maternal employment is not conducive to student achievement has been examined frequently and has not been substantiated (Leibowitz, 1977).

Father absence has been shown to be detrimental to cognitive development. Its effects are more pronounced in boys than in girls, more pronounced in mathematics and related skills than in English and comprehension (Sutton-Smith et al., 1968) and most pronounced if the child is nine years old or younger when he/she becomes fatherless.

The "British" and "Chicago" Schools Levine (1983) offered support for the hypothesis that differences in what families do rather than family characteristics per se influence achievement in school. In a recent

analysis of a wealthy, highly educated community in the New York City metropolitan area, he concluded that, among SES factors analyzed, when other factors were held constant, only the level of education of the father could be used to help explain student achievement differences.

Bradley and Caldwell (1976) devised an instrument, the Home Observation for Measurement of the Environment (HOME), to measure environmental effects on mental task performance with a sample of children at age three and again at age four and one-half years. They concluded that, when other environmental factors are held constant, socioeconomic factors do not seem to influence cognitive development. Among the six subscales used, those measuring "maternal involvement with the child" and "the provision of appropriate play materials" were the best predictors of test performance. Disciplinary practices employed by the parents did not influence test results. The relative predictive value of five of the six HOME subscales remained constant across the 18-month period. The sixth, "opportunities for variety in daily stimulation," declined in importance.

These findings are bellwethers of the current trend in research away from examination of the readily quantifiable aspects of the student's external environment to the more theoretical and subjectively measured qualitative aspects of the environment that many educators feel are the true "causes" not only of the observed differences in student growth and performance, but of the very SES and family characteristics that have been used to explain student differences. Although these endogenous variables of attitudes and abilities of parents are difficult to measure, several attempts have been made.

The available evidence does not, for example, support the supposition that close parental involvement in task completion is associated with higher levels of cognitive functioning. Crandall (1964) observed that very low and very high levels of parental participation were detrimental to girls' mastery of various tasks, but moderate participation seemed to be beneficial. Radin (1981) added that paternal nurturance is negatively associated with boys' completion of tasks requiring mastery efforts. Boerger (1971) surveyed the fathers of fifth- and sixth-grade boys and concluded that, although fathers of high-achievers hold high expectations for their sons, they are only indirectly involved in their sons' academic activities.

Hill and Stafford (1974) discovered that high-SES mothers spend two to three times more time caring for their children than low-SES mothers, and that the market time involvement of high-SES mothers increases rapidly by comparison with low-SES mothers as their children get older. This observation is consistent with the widely held belief that time is more important in raising young children, but that market inputs such as schooling costs, obtainable only with the fruits of employment, are more important for older children.

Other researchers have attempted to isolate and examine individual facets of time use, parent-child interaction, and the allocation of educational resources in the home. Williams, et al. (1982), in a meta-analysis of 23 articles from four countries spanning a period of 26 years, reported a slight negative relationship between weekly hours of television viewing and achievement, but noted that the effect is small. Levine's (1983) work corroborated Williams' findings with regard to television viewing. He also noted, with some trepidation, that when other

factors such as IQ and SES are held constant, there appears to be a negative relationship between achievement in mathematics and reading and the amount of time a child spends (1) doing homework, (2) in the company of adults, (3) shopping with parents, and (4) eating dinner with other members of the family. Positive relationships were identified between achievement and (1) time spent playing alone, and (2) the amount of time parents spent reading to the child when the child was in preschool.

The great majority of studies that have examined associations between children's academic attainment and characteristics of their home environments have utilized a single-sampling co-relational approach; that is, an attempt to correlate one set of measures of home environment attributes with one set of measures of academic attainment. Although many associations have been identified between achievement and factors measuring socioeconomic status, family constellation, parents' attitudes and expectations for their children, and the quality and quantity of parent-child interactions, in most cases, the dynamics of the relationships are poorly understood. In addition, many prominent studies have focused upon populations of urban and "disadvantaged" children. It is not known whether or to what extent their findings may be generalized to populations with radically different demographic characteristics.

I am currently engaged in a study that is attempting to address both of these concerns by (1) following the same group of 198 students as they progressed from third through fifth (and in some cases, sixth) grade; and (2) by focusing on two medium-size urban and two small-town/rural areas that are generally representative of 90 percent of the school districts in Wisconsin. Four types of data were gathered. Students' academic aptitude was assessed using the Otis-Lennon Mental Ability Test (OLMAT) (three

schools) or the Test of Cognitive Skills (TCS) (one school). Academic progress was monitored annually using the reading and mathematics sections of the Stanford Achievement Test (SAT). Seven subscales of the Self-Observation Scales (SOS) (Stenner and Katzenmeyer, 1975), also administered at the end of each school year, were used to measure affective development or, more specifically, students' own perceptions of their self-concept and the quality of their relationships with their school, their teachers, and their peers. Finally, at some point during the study, one parent of each student, usually the mother, was interviewed by telephone. The lengthy interview provided brief answers to 113 questions assessing eight aspects of the home environment. Fourteen questions provided a profile of each child's family constellation. Twenty questions examined both the child's and parents' use of time, with an attempt, through aggregation of responses to several interview questions, to account for the child's entire "normal" school day. Thirteen questions examined both parents' education and occupations and several other socioeconomic characteristics. Twelve measured the quantity and variety of reading materials in the home. Thirteen questions provided a profile of the educational climate of the home, concentrating upon parents' priorities for the child's involvement in extrascholastic activities. Fifteen questions investigated the quality and quantity of interactions between the parents and the child's school, and 14 sought parents' opinions about the school and its success in meeting the child's needs. Twelve questions dealt with parental assessments of the child's opinions about the school.

Given the complications of analyzing enormous data sets, the first task was to reduce the pool of home environment variables to a manageable size. Two techniques were employed:

1. Factor analysis of the entire variable pool created 13 orthogonal factors with characteristic roots greater than 2.0. Clusters of five to ten variables highly correlated with each factor ($\underline{R} > .30$) were identified. Ten of the 13 clusters so constituted were comprised of variables bearing considerable empirical relationship to one another. In each of these ten cases, one or two variables with the highest correlation to the factor ($\underline{R} = .56$ to .92) were selected as a proxy for the others.

2. A matrix of partial correlation coefficients between the 113 home environment variables and all self-concept, achievement, and achievement growth variables obtained during the study was examined. The effects of students' academic aptitude, treated as a control variable throughout this study, were partialled out. An exclusion rule was applied which resulted in the elimination from further consideration of all home environment variables that did not have significant ($\underline{p} < .05$) partial correlations to either (a) two of the four available measures of achievement in reading or mathematics; (b) two of the three available measures of growth in reading or mathematics achievement (defined as change in SAT scaled scores over a one or two year interval); or (c) two of the three available measures for each of the seven realms of affective development assessed by the SOS instrument.

In essence, each home environment variable was given twelve opportunities to survive the initial cut based on one indication of ability to serve as a proxy for other variables and/or one or more of 11 durable associations with achievement, growth, or self-concept.

At this point, the sample population was divided into five groups including (1) all 198 students, (2) 107 boys, (3) 91 girls, and (4 and 5) high and low achievers (defined as students above the 75th and below the 25th sample population percentile on each reading and mathematics achievement index).

For each group of students and each of the home environment variables (HEV's) surviving the initial cut, the following questions were asked:

Q 1: Is the HEV systematically (and linearly) related to achievement?

Q 2: If so, does the strength of the relationship appear to increase, decrease, or remain constant as the students mature?

Q 3: Is the HEV systematically (and linearly) related to any of the affective (SOS) measures which are themselves related to achievement or growth in reading or mathematics?

Q 4: If so, does the strength of the relationship appear to increase, decrease, or remain constant as the students mature?

Hence Questions 1 and 2 examined the direct path of influence depicted by Arrow A in Figure 1, and Questions 3 and 4 examined the indirect path of influence depicted by Arrows B and C.

Two additional pathways (depicted by Arrows D and E in Figure 1) were also examined. Previous research has shown that personal characteristics of the student such as intelligence, aptitude, gender, age, and ethnicity have a direct bearing on each of the outputs of the education production process. Intelligence and cognitive aptitude are unquestionably the preeminent determinants of academic attainment and have been linked as well with each of the seven facets of affective development examined in this study (Katzenmeyer & Stenner, 1975). Distinct differences between males and females of this age group were also noted by Katzenmeyer and Stenner (1975). Sex differences favored females on Teacher Affiliation, Self-Acceptance, School Affiliation, and Social Maturity while males

evidenced higher scores on Self-Security. No significant differences were evident between males and females on Social Confidence or Peer Affiliation. Stevens (1975) noted significant increases in Social Maturity, Social Confidence, and Self-Acceptance, a slight increase in Peer Affiliation, and a significant decline in School Affiliation as students progressed through the intermediate grades.

Table 1 provides a summary of descriptive information for the achievement and growth, self-concept, and cognitive aptitude measures obtained from the 198 participating students, and gives zero-order coefficients of correlation between each of these measures and two control variables (student gender and cognitive aptitude [CAI]) and one home environment variable (an index of socioeconomic status for the student's family).

Several observations were made based on this information:

Obs. 1: Throughout the study, students in the four schools performed at a level well above the national norm in both reading and mathematics. (Their achievement was not uncharacteristic of students from rural and small urban schools in Wisconsin, however.)

Obs. 2: The mean of student CAI's was nearly one standard deviation above the standardized population mean for CAI scores.

Obs. 3: Stevens' (1975) findings with regard to age differences in Social Maturity, Social Confidence, School Affiliation, and Teacher Affiliation were substantiated. For this sample population, however, significant increases not noted by Stevens were observed on the Self-Security and Peer Affiliation subscales, and no significant change was noted in Self-Acceptance.

TABLE 1
DESCRIPTIVE STATISTICS FOR ACHIEVEMENT, GROWTH AND SELF-CONCEPT VARIABLES AND THEIR CORRELATIONS WITH STUDENTS' COGNITIVE APTITUDE, GENDER AND FAMILY SES

		POPULATION MEANS		ZERO-ORDER CORRELATION WITH:		
	Grade	National percentile	Scaled or t-score	Cognitive aptitude index	Gender	Family SES
Reading Achievement	2	76.3	144.8	.482	-.026	.183
	3	65.9	152.3	.689	.131	.235
	4	61.9	162.0	.568	.183	.320
	5	64.7	172.8	.699	.039	.335
Reading Growth	3-4	n.a.	10.1	.032	.119	.233
	4-5	n.a.	11.1	.182	-.178	-.046
	3-5	n.a.	21.1	.266	-.112	.257
Mathematics Achievement	2	65.0	134.3	.639	-.194	.105
	3	61.3	148.7	.621	-.085	.204
	4	65.5	163.1	.597	.056	.237
	5	62.4	172.7	.684	-.005	.252
Mathematics Growth	3-4	n.a.	14.8	.249	.135	.215
	4-5	n.a.	9.6	.299	-.071	-.020
	3-5	n.a.	24.7	.475	.024	.232
Self-Acceptance	3	64.2	53.7	.233	.089	-.059
	4	59.3	52.0	.243	.188	-.017
	5	63.2	53.5	.177	.247	.144
	Avg	63.4	53.3	.321	.230	.062
Self-Security	3	51.2	50.1	.273	-.099	-.006
	4	54.4	51.3	.229	-.083	.117
	5	59.6	52.9	.226	-.093	.063
	Avg	56.8	51.7	.327	-.128	.063
Social Maturity	3	59.6	52.3	.349	.041	-.040
	4	59.0	52.2	.263	.153	-.029
	5	65.7	54.5	.147	.221	.067
	Avg	61.6	52.9	.369	.187	.040
Social Confidence	3	63.1	53.8	.271	.065	-.059
	4	64.1	54.0	.333	.102	.060
	5	67.5	55.3	.208	.101	.086
	Avg	67.5	54.5	.382	.114	.077
School Affiliation	3	61.3	53.5	-.003	.278	.024
	4	44.7	47.9	.050	.283	.014
	5	43.5	47.5	.109	.233	.125
	Avg	51.8	49.7	.056	.373	.087
Teacher Affiliation	3	65.7	54.1	.120	.170	.017
	4	55.2	50.3	.218	.276	.041
	5	57.3	51.3	.074	.276	.158
	Avg	57.2	51.8	.216	.346	.148
Peer Affiliation	3	56.1	50.9	.240	-.020	-.050
	4	57.2	51.4	.220	.028	-.002
	5	61.5	52.8	.196	.069	.018
	Avg	58.0	52.0	.316	.020	-.018

Coefficients with absolute values exceeding .15 and .195 are significant at the $p < .05$ and $p < .01$ levels. n.a. is not available. Students' gender coded: male = 1; female = 2. Avg is the student's average of three scores on the specified SOS index.

Obs. 4: In general, it appears that students in the sample population had a more positive self-concept than students in the nation at large. Their grouped mean scores were consistently significantly higher than the 50th percentile on all subscales with the exception of School Affiliation. The differences were particularly large for Social Confidence, Self-Acceptance, and Social Maturity.

Obs. 5: All of the relationships between self-concept and gender identified by Katzenmeyer and Stenner (1975) were verified. Females scored higher on the Self-Acceptance, Social Maturity, School Affiliation, and Teacher Affiliation subscales, and males evidenced higher scores on Self-Security. No significant differences between males and females were apparent on Social Confidence or Peer Affiliation. In addition, repeated examination of the same students revealed, in this case, that the gap between females and males with regard to Self-Acceptance, Social Maturity, and Teacher Affiliation actually widened as the students got older. This is consistent with the common observation that girls at this age are physically more mature and more socially aware than boys.

Obs. 6: Katzenmeyer and Stenner (1975) also examined the relationship between socioeconomic status and self-concept and found a dominant SES effect on all seven SOS subscales. High SES was associated with low School Affiliation and with high scores on each of the other six SOS indices. They concluded that children from socioeconomically desadvantaged backgrounds have a high incidence of low self-concept. There was little evidence in this study to support or contest these findings, probably due to the lack of socioeconomic diversity in the sample population. There was a tendency for positive and increasing association between SES and each of the seven self-concept indices excepting Peer

Affiliation, but the associations were weak and lacking in statistical significance. Although the coefficients themselves were not significant, a distinct tendency for increasing positive association between SES and six of the seven SOS indices was noted as the children matured.

Obs. 7: Comparison of gender differences in achievement and growth were inconclusive but tended to favor girls slightly in reading and boys in mathematics and reading growth. Across the three year period, however, none of these differences were statistically significant.

It is important to note here that a primary objective of this research was to identify and describe relationships between independent and dependent variables that could be attributed to factors over which parents and educators have no control. Once identified, interpretations of the strength of association and implications for future actions become more lucid. For example, if A, an index of self-concept, is a reasonably good predictor of B, a desired educational outcome such as reading achievement, it is worthwhile to ask what portion of the association between A and B may be explained by uncontrollable factors U such as intelligence, gender, and age; and hence, what unexplained portion may be influenced by other factors C that are subject to the influence of parents, educators, and society. It follows that if U explains most or all of the association between A and B, little reward in terms of improvement in B can be anticipated as the result of efforts to change A. On the other hand, if U does not explain the A-B association, there is more reason to believe that efforts to increase B by changing A will have desirable results.

The Relationship of Self-Concept to Academic Attainment

Research has consistently identified a positive link between self-concept and scholastic performance. Links have also been identified between self-concept and ability, age, and gender. It has been suggested that a redirection of educational emphasis towards efforts to improve self-concept should result in increases both in the targeted facets of self-concept and in academic performance. In light of what is already known about the apparent causal relationship of these uncontrollable factors (cognitive aptitude, gender, etc.) to self-concept, and the well-established relationship of academic ability to scholastic performance, is this supposition justified? The following discussion examines the results of data analysis undertaken to provide answers to this complicated question.

Stepwise linear regression analysis was used to examine relationships between achievement/growth and self-concept. Each examined the association of a dependent variable (one of the 14 achievement and growth indices) and nine independent variables (CAI, gender [except when gender was a criterion for group selection], and one set of seven SOS indices). In summary, for the entire sample of 198 students, for separate samples of boys and girls, and for each subject--reading and mathematics--the following regressions were performed:

(1) Grade 2 achievement regressed on Grade 3 SOS and average SOS;

(2) Grade 3 achievement regressed on Grade 3 SOS, Grade 4 SOS, and average SOS;

(3) Grade 4 achievement regressed on Grade 3 SOS, Grade 4 SOS, Grade 5 SOS, and average SOS;

(4) Grade 5 achievement regressed on Grade 4 SOS, Grade 5 SOS, and average SOS;

(5) Growth from Grade 3 to Grade 4 regressed on Grade 3 SOS, Grade 4 SOS, and average SOS;

(6) Growth from Grade 4 to Grade 5 regressed on Grade 4 SOS, Grade 5 SOS, and average SOS; and

(7) Growth from Grade 3 to Grade 5 regressed on Grade 3 SOS, Grade 4 SOS, Grade 5 SOS, and average SOS.

Examination of students in the top and bottom quartiles (high and low achievers) considered all of the above except previous and following year combinations of achievement and SOS; and Grade 3 to Grade 4 and Grade 4 to Grade 5 growth.

Following the application of a "spurious association" exclusion rule that was designed to separate chance associations from reasonable, consistent, and longitudinally durable associations, four observations were made.

Obs. 8: All of the significant associations between self-concept and achievement/growth noted in examination of Group 1 (the entire sample of 198 students) were manifestations of even stronger associations for one or more of the subsets of Group 1.

Obs. 9: There was, with but one exception, no evidence that prediction of achievement or growth in reading and mathematics is enhanced with prior knowledge of a student's levels of affective development as measured by any of the seven SOS subscales. The lone but consistent and reasonably robust exception was the contribution of the Social Maturity index for third graders to the prediction of growth in math from third through fourth and from third through fifth grades. Boys' third-grade Social Maturity was the single most powerful predictor of growth in mathematics during fourth grade (exceeding even the CAI index with $\underline{R}^2$ = .136) and also contributed to the ability of CAI to predict math growth during fourth and fifth grades combined (partial-$\underline{R}^2$ = .057). Girls'

third-grade Social Maturity was the single most powerful predictor of growth in math during fourth and fifth grades ($\underline{R}^2$ = .188). No other SOS index obtained at the end of third grade made a significant contribution in regressions predicting fourth-grade reading and math achievement or growth in reading over any one- or two-year period. No SOS index obtained at the end of fourth grade made a significant contribution in regressions predicting fifth-grade reading and math achievement or growth in either subject from fourth through fifth grade.

Obs. 10: Two self-concept variables, Social Confidence and Teacher Affiliation, made moderate and consistent contributions to the explanation of variance in previous and concurrent measures of reading achievement for girls (partial-$\underline{R}^2$ = .03 to .17) and for low achievers (partial-$\underline{R}^2$ = .06 to .29); math achievement for girls (partial-$\underline{R}^2$ = .03 to .06); reading growth for girls (partial-$\underline{R}^2$ = .08); and math growth for girls (partial-$\underline{R}^2$ = .05).

It was not possible, with the available information, to determine whether, for these two groups, Teacher Affiliation and Social Confidence were the beneficiaries of a general feeling of personal reward due to academic successes that were measured by the achievement tests, or whether the determinants of academic success and the determinants of positive Teacher Affiliation and Social Confidence are similar. There was no evidence to suggest that positive Teacher Affiliation precedes, causes, or is in any way associated with increases in subsequent measures of achievement.

Obs. 11: The self-concept indices Self-Acceptance, Self-Security, School Affiliation, and Peer Affiliation did not make consistent or substantial contribution to the explanation of variance in achievement or

growth in reading or math for any of the five groups of students. Nor did any of the seven SOS indices make consistent or substantial contribution to the explanation of variance in reading or math achievement or reading growth for boys or for high achievers.

The Relationship of Home Environment Characteristics to Self-Concept

For the purpose of this research, students' self-concept was treated solely as a potential input with respect to achievement. The legitimate status of self-concept as an output in its own right of the education-production process was not considered. Thus investigation of the influence of home environment characteristics on self-concept dealt only with those self-concept indices which in turn were related to the academic attainment of particular groups of students--Social Maturity, Teacher Affiliation, and Social Confidence.

Twenty-three home environment variables were selected on the basis of at least one significant ($p < .05$) partial correlation to at least one of the seven self-concept indices. (The common relationship of CAI to both groups of variables was partialed out.) The remaining 89 HEV's failed this entrance criterion.

Obs. 12: While HEV associations with the self-concept variables Self-Acceptance, Self-Security, School Affiliation, and Peer Affiliation were not examined in any great detail, it is worthwhile to note that no HEV was able to explain more than 10 percent of the variance in any one of the three yearly measures of any of the seven self-concept indices, or more than six percent of the variance in the average of the three yearly scores for each self-concept index, whether or not coincidental relationships with the CAI were taken into account.

Obs. 13: Only one HEV made a significant and consistent contribution (partial-$\underline{R}^2$ = .05 to .08) to predictions of Social Maturity. Social Maturity was the only self-concept variable demonstrating premonitory capabilities with respect to any of the measures of academic success (math growth only). This variable (PROBLEMS) represented an aggregation of all of the types of problems the child had in school during the preceding year that required parental involvement. PROBLEMS also made a consistent contribution to the prediction of both Teacher Affiliation and Social Confidence and, as shall be demonstrated, to several measures of academic success. In all cases, PROBLEMS was associated with low levels of self-concept, achievement, and growth.

Obs. 14: Three other HEV's measuring fathers' attendance at parent-teacher conferences the previous year (PTCONPA), the amount of time parents spent helping the child with homework (XMAPAHMWK), and parent responses indicating that the child disliked various school-related social activities (HATESOSHL) made consistent, albeit weak (partial-R^2 = .01 to .04) contributions to the prediction of Social Confidence. The association was negative in all three cases.

These three HEV's, along with PROBLEMS, seem to reflect parents' awareness of and attempts to deal with social and academic problems experienced by the child, and are quite clearly responses to, rather than sources of the observered differences in students' self-concept and academic attainment. In summary, no individual HEV or category of HEV's examined in this study appeared to be a determinant of any of the self-concept measures that were related to the students' academic performance.

The Relationship of Home Environment Characteristics to Students' Achievement and Growth in Reading and Mathematics

Using the two techniques outlined on p. 11, exploratory analysis of the entire data set resulted in reduction of the field of 113 HEV's to 27 for more detailed examination. These included:

(1) six socioeconomic variables--fathers' and mothers' total years of formal education (PASCHOOL, MASCHOOL), the market value of the home (HOMEVALU), father's job status (PAJOBSTAT), estimated total family income for the preceding year (INCOME), and a socio-economic index for the family based on a weighted combination of the job status and level of education of both parents (FAMILYSES)

(2) three measures of reading materials available in the home--estimated total number of books (#BOOKS), subscription to a professional magazine (PROFMAGZN), and an index of the variety of available reading matter (READMATL) comprised of a sum of affirmative responses to eight inquiries about the presence of a newspaper, encyclopedia, dictionary, and five types of magazines in the home;

(3) six parental estimates of the child's time-use outside the school--minutes per day doing homework (HOMEWORK) and reading to him/herself (READSELF); hours per month attending church and Sunday School (RELIJUS), participating in organized community recreational activities (SPORTS), and practicing for and attending music and dance lessons (ARTMUSIC); and combined time spent in all organized activities (CLUBTIME);

(4) two estimates of parents' time-use--combined minutes per day helping the child with homework (XMAPAHMWK) and hours per week of maternal employment (MAWORKTIME);

(5) two measures of parents' interaction with the child's school during the previous year--fathers' attendance at a parent-teacher conference (PTCONPA) and whether or not one or both parents did any volunteer work at/for the school (MPVOLUNTR);

(6) three measures of the child's tendencies to have problems at school--problems with another student (STUDNTPROB), an aggregation of affirmative responses to all ten interview questions dealing with problems (PROBLEMS), and parents who reported that the child disliked the academic aspects of school (HATECLASS);

(7) five variables not elsewhere classified which, if anything, gave a profile of the general educational climate in the child's home--parents' assessments of the child's performance in school (KIDJOB), the school's performance in meeting the child's needs (SKULJOB); parents who felt that the school was strong academically (STRACAD); the number of organized extra-scholastic activities in which the child participated (#CLUBS); and the number of children in the home (#KIDS).

Dependent variables were separated into four groups including achievement measures--four SAT scaled scores each for Total Reading (Group 1) and Total Math (Group 2) obtained for each student at the end of Grades 2, 3, 4, and 5; and growth measures--three measures each of growth in reading (Group 3) and mathematics (Group 4) based on scaled score gains (losses) during Grade 4, Grade 5, and Grades 4 and 5 combined.

In the second stage of data analysis, each set of achievement and growth indices was regressed upon each of the seven categories of HEV's mentioned above for the entire sample population and for separate groups of boys and girls. (Groups of high and low achievers have not been examined as yet.) CAI was included as a regressor in each instance, the intention being to examine the proportion of variance in academic attainment explained by the HEV's over and above that explained by the CAI.

An individual HEV was retained for further examination if it made a significant ($p < .05$) contribution to the ability of the variables in its HEV category to account for variance in at least two of the four measures of achievement or two of the three measures of growth in either reading or mathematics.

In the third stage of analysis, twelve new categories of HEV's were created. Each contained the CAI and all HEV's which survived the second stage exclusion procedure with respect to a particular group of students

and a particular set of achievement or growth variables. Six additional (and hopefully more stable) achievement variables were created by summing each students' Grade 3 and 4, Grade 4 and 5, and Grade 3 through 5 scores in each subject. Finally, each new category of HEV's was regressed upon the seven achievement or three growth indices for the specified group of students. For example, if, as was the case, the HEV's PROFMAGZN and #CLUBS made significant contributions to the ability of their HEV categories (reading materials and home educational climate respectively) to predict at least two of the three measures of growth in math for girls, they were then combined in a single category along with CAI, and again regressed against girls' math growth.

Data analysis has not yet progressed to the point where definitive statements may be made or conclusions drawn. Multiple regression analysis has been heavily used and the ordinary caveats regarding regressions will apply until tests have been completed to determine whether, and to what extent the derived models are linear and free from the influence of observations with large standard residuals and/or extreme values on powerful predictors. Nevertheless, a number of preliminary observations and trends bear mentioning. Several HEV's appeared to make significant and consistent contributions to the prediction of academic attainment. They are listed below in approximate order of strength. The nature of the association (+ or -), and its tendency, as the children matured, to increase in strength (<), decrease in strength (>), remain the same (=), or vary in no discernible fashion (nt) is given in parentheses.

Obs. 15: Contributing to the prediction of reading achievement were:

for all students	for boys	for girls
MAWORKTIME (-,<)	MAWORKTIME (-,<)	STRACAD (+,nt)
FAMILYSES (+,<)		#CLUBS (+,nt)
SPORTS (-,=)		
HOMEWORK (-,=)		
ARTMUSIC (+,nt)		
STRACAD (+,nt)		

Obs. 16: Contributing to the prediction of math achievement were:

for all students	for boys	for girls
MAWORKTIME (-,>)	MAWORKTIME (-,>)	STRACAD (+,<)
MASCHOOL (+,>)	INCOME (+,<)	PROBLEMS (-,=)
SPORTS (-,=)	HATECLAS (-,>)	
	PROBLEMS (-,nt)	

Since only two consecutive measures of growth were available, trends for HEV/academic-growth associations to vary over time could not be determined.

Obs. 17: Reading growth proved extremely difficult to predict for all three groups of students, no matter what set of self-concept or HEV predictors was used. Providing some predictive utility were:

for all students	for boys	for girls
FAMILYSES (+)	FAMILYSES (+)	#CLUBS (+)
SPORTS (-)		
PROFMAGZN (+)		

Obs. 18: Contributing to the prediction of mathematics growth were

for all students	for boys	for girls
READMATL (+)	HATECLAS (-)	STRACAD (+)
STRACAD (+)	FAMILYSES (+)	STUDNTPROB (+).

Obs. 19: Since the variable KIDJOB was not really a measure of any home attribute, it was considered in a separate set of regressions. KIDJOB made an extremely powerful contribution (partial-$\underline{R}^2$ = .10 to .20) to the prediction of all fourteen measures of achievement for all three groups of students, and to math growth predictions for boys and for all students (partial-$\underline{R}^2$ = .03 to .10). Implications of this finding are not clear, but it is quite apparent that on reading and math achievement tests, children

whose parents think they are doing well in school outperform those whose parents feel they are doing poorly, even when their academic aptitude, as measured by the CAI, is controlled.

An attempt was made, within the limitations of the data, to examine Crandall's (1964) observation that, for some students, very low and very high levels of parental participation were detrimental to task mastery efforts, but that moderate participation seemed beneficial. The existence of such a curvilinear relationship might explain why the variable XMAPAHMWK, (which was negatively correlated [$\underline{R}$ = -.3 to -.4] to both reading and math achievement) did not make a significant contribution in any of the regressions.

Students' reading and math achievement scores obtained in Grades 3, 4, and 5 were summed to obtain READTOTL and MATHTOTL. These were then plotted against the variable XMAPAHMWK. In addition, sample READTOTL and MATHTOTL means were obtained for twenty overlapping cross sections of the sample population based on increasing levels of the variable XMAPAHMWK.

Obs. 20: True to Crandall's observations, a gradual increase in achievement in both subjects was associated with increased parental involvement up to 8 to 10 minutes per day, whereupon achievement levels declined precipitously, then leveled off in the region of 30 minutes per day, before increasing slightly in the region of 45 to 90 minutes per day.

It would appear that parents help their children with homework for two reasons--to supplement school lessons, and to help compensate for the child's difficulty in dealing with school lessons on his own. Parents who never help with homework (over one-fourth of the parents in this study did not) may be neglecting an opportunity to refine and punctuate the rather impersonal and generic approach inherent in group instruction. By virtue

of their unique ability to draw upon the child's own realm of experiences, parents who take an active interest in the child's formal education not only communicate a sense of the value and importance of education, but help the child find a permanent place for newfound knowledge in his outside-of-school life. A child may be perfectly capable of understanding the lesson with no supplementary parental help, but may, when his parents do not become involved, fail to grasp the importance of the lesson, or fail to mark it with the sort of personal inscription that will assure its permanent retention.

Other children, of course, do not grasp the lessons of school. Special classes are designed to accommodate some of them, but others are often left to get by as best they can. It would appear that about 10 to 15 percent of the parents in this study were providing compensatory help of the sort that special education classes attempt to provide, and providing it in rather large doses (15 to 90 minutes per day). Children receiving this amount of parental assistance were characterized by both low aptitude and low achievement. Does the assistance help or, as Crandall suggested, is it harmful? It is hard to say. For those few students who received in excess of 45 minutes of parental help each day, it may help. Although students high in XMAPAHMWK and HOMEWORK registered growth scores comparable to the sample population mean in reading, they continued to fall farther behind in math. It is not known what might have happened had they received no parental help.

Obs. 21: Of all HEV's examined, MAWORKTIME, through its negative correlation to both reading and math achievement, made the most powerful and consistent contribution to regressions predicting all students' achievement (partial-$\underline{R}^2$ = .03 to .07 for reading and .02 to .04 for

math); and boys' achievement (partial-$\underline{R}^2$ = .04 to .07 for reading and .04 to .10 for math). MAWORKTIME did not contribute to the prediction of girls' achievement.

Additional regressions examined the relationship of MAWORKTIME to achievement for (1) only those students, and (2) only those boys whose mothers were employed; and (3) all students, and (4) all boys, treating maternal employment as a dichotomous variable (0 = not employed, 1 = employed). The results were essentially the same as noted in Obs. 21.

Correlations of MAWORKTIME to a variety of potential intervening factors were examined (e.g., MASCHOOL, PASCHOOL, CAI, INCOME, and FAMILYSES--five variables traditionally associated with higher levels of achievement). Surprisingly, employed mothers were slightly but not significantly better educated, with higher family income and SES, better educated husbands, and children with greater aptitude than mothers who were not employed.

On the other hand, examination of six home environment characteristics traditionally associated with low achievement revealed that children of employed mothers spent significantly more time watching television; spent less time reading to themselves and participating in organized activities, especially Sunday school/church, scouts, and youth groups; were more apt to have problems at school, especially with their academic progress; and were less apt to report that they liked their classes.

It is possible, in this manner, to conjure up profiles of high-SES families, families whose children participate in community recreation activities, whose daughters participate in all sorts of activities, and so forth, for each of the HEV's linked with higher or lower levels of

achievement. Both the problem and the process of its solution are akin to looking for the causes of cancer. Just as no two bodies respond in precisely the same manner to the same set of carcinogenic stimuli, no two children can be expected to respond in identical fashion to the same set of home-environment catalysts or deterrents to their academic success. Since first hand observations of the "how" and "why" of parent-child interactions are unfeasible from both practical and economic standpoints, researchers examining the parent-child and home-school interfaces are limited to examining the "what," and therefore are, to a large degree, reduced to practicing the imprecise science of symptomatology. Still, taken in this context, the information can be useful both to parents who are interested in creating a stimulating environment for their children, and to educators who are entrusted with the task of filling in the gaps in the child's preparation for the responsibilities of adulthood.

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